

# Sweetly Control Fly Pests

Insect dipteran pests damage a wide range of agricultural crops and livestock, and transmit a variety of vector-borne diseases to humans. Current control methods heavily depend on non-specific chemical insecticides which negatively impact the environment and human health and can lead to chemical resistance. There is a need to replace current control methods with environmentally friendly alternatives. ARS has developed an insecticidal formulation based on non-nutritive sugars to control spotted-wing drosophila adults, and it has potential to control other fly pests and mosquitoes.

Docket No: 47.19

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)



## Benefits

- The artificial sweetener formulation is a biologically-based insecticide
- Could be an organic control alternative to chemical insecticides
- Provides a safe and simple method

## Applications

- The sugar formulation can be sprayed directly on berry crops including blueberry plants
- This formulation can be used as a delivery agent or feeding attractant combined with conventional or biological insecticides to enhance insecticidal efficacy
- The method can be expanded to other Dipteran pests

# Methods of Attracting *Drosophila* *Suzukii*

A Method of attracting *Drosophila suzukii*, involving treating an object or area with a chemical attractant composition based on apple juice volatiles that attract *Drosophila suzukii*.

Docket No: 148.18

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)



## Benefits

- The compound is a synthetic natural attractant based on fruits
- The method provides a means of early detection and population monitoring of *Drosophila suzukii*

## Applications

- Infestation detection and monitoring
- Could potentially enable future development of mass trapping and mating disruption technologies for managing this pest

# A Nematicide Having Low Toxicity Made from Corn Starch and a Vegetable Oil Derivative

When water-insoluble corn starch is combined with a water-insoluble fatty amine salt (from vegetable oil) at elevated temperature using a common industrial technique, an amylose inclusion complex is formed which acts as a nematicide.

Docket No: 128.18

Contact: [Renee.Wagner@ars.usda.gov](mailto:Renee.Wagner@ars.usda.gov)



Damage caused by plant-parasitic nematodes to raspberry (left) and wheat (right). Smaller plants

## Benefits

- Order of magnitude safer than current nematicides
- Ease of application
- ~100% Biobased and biodegradable
- Ingredient costs less than \$1/lb

## Applications

- Ease of use and safety makes this ideal for controlling nematodes in the home garden
- Cost makes this an ideal addition to a multi-faceted approach to controlling nematodes in agricultural settings

# DEEPER ROOTING 1 Gene

The shape of a plant's root system impacts the resources it can access. The DEEPER ROOTING 1 (DRO1) gene assists in modulating the angle at which the roots grow. Knot-out mutations in the DRO1 gene lead to horizontal root growth, while plants that over-expressed DRO1 have more downward root growth.

Docket No: 106.15

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)



## Benefits

- More downward root growth may lead to increased access to water at deeper soil layers
- Potential for improving plant stability in soil

## Applications

- Trees and other plants with altered root system shape to better access soil resources such as water and nutrients, as well as potentially improved anchorage

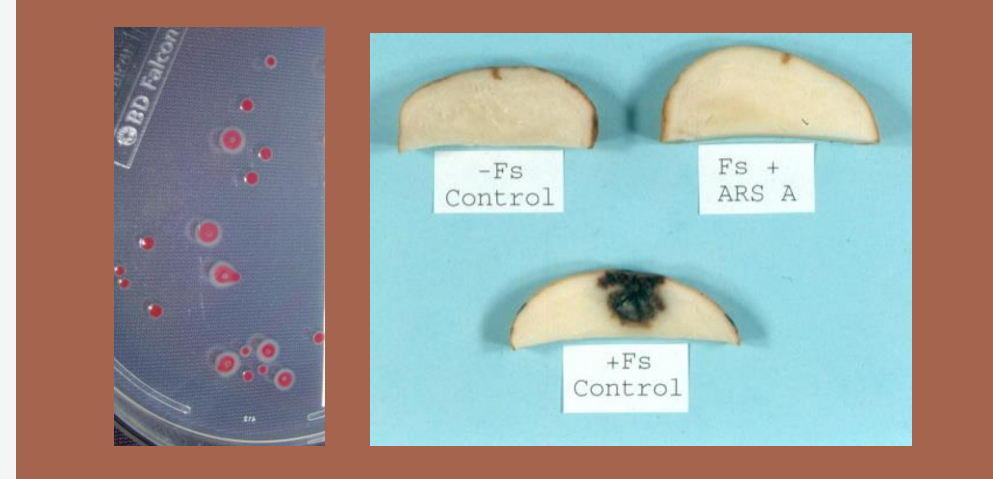


# Desiccation Resistant *Pseudomonas*

Novel *Pseudomonas* strains were generated using adaptive laboratory mutagenesis to repetitively challenge the parent population during exposure to stressed conditions of growth, drying, long term dry storage and rehydration. Resistant variants were isolated and ranked based on high viable cell yield, recovery after dry storage, suppression of potato disease, and rapid growth on low cost medium, including hydrolyzates of renewable lignocellulosic biomass. The desiccation resistant bacterial strains and method of mutagenesis are included in the invention.

Docket No: 137.17

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## Benefits

- Is a dry storable agent that provides broad protection against a variety of potato maladies, including fungal diseases (Fusarium dry rot, late blight, pink rot, and others) and sprouting
- Will reduce the use of azole chemistries in agriculture that have lost efficacy due to widespread resistance of target pathogens
- May lessen efficacy loss of medically important azoles used to control fungal infections in humans

## Applications

- Is a biological agent to be applied to potatoes (and potentially other crops) to control fungal infections and reduce sprouting.

# Antisense Oligo Targets Bacterial pathogens in Plants and Insects

This invention relates to bactericidal molecules to suppress bacterial pathogens inside of plants (Citrus trees or Potato) and insects (Hemiptera: Psyllids and Leafhoppers).

Specifically, Liberibacter pathogens, but also gram-negative or gram-positive bacteria.

Suppression of Liberibacter bacteria in potatoes reduced symptoms, and suppression of bacteria in citrus trees is associated with increased retention of fruits.

Docket No: 40.17

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)



Untreated infected

Treated infected

## Benefits

- Provides protection against Bacteria, including *Candidatus Liberibacter* (Citrus pathogen) and *Candidatus Liberibacter solanacearum* (potato pathogen)

## Applications

- Prevent and reduce spread of citrus huanglongbing, HLB, and Zebra Chip in potato
- Suppression of other bacterial plant pathogens
- Suppression of insects by targeting endosymbionts

# RNAi Strategies for Control of Whitefly

A double stranded RNA that targets genes important for the viability of the whitefly. By suppressing expression of key genes, the whitefly dies quickly, reducing whitefly populations on plants treated with these RNA constructs or on modified plants producing the RNAs. Reduced incidence of whitefly numbers and whitefly feeding on plants has the potential to greatly reduce transmission of whitefly-transmitted plant viruses that infect a wide array of crops.

Docket No: 105.17

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)



## Benefits

- Provides broad plant protection against whitefly, *Bemisia tabaci*, *B. argentifolii*, and biotypes, by reducing populations
- Could result in a reduction in the use of insecticides in crop production
- Can be applied as topical product or incorporated into plant expressed systems

## Applications

- Efficacious whitefly suppression to combat pest and the viral pathogens they transmit
- Increase yields by reducing losses to whitefly

# Double Stranded RNA for Asian Citrus Psyllid Control

Novel double stranded RNA constructs that target trehalase enzyme, gene expression in psyllids. Trehalose is the major blood sugar in insects with a crucial role as an instant source of energy and in dealing with abiotic stresses.

The hydrolysis of trehalose is under the enzymatic control of trehalase. The use of constructs suitable as topical applied or incorporation for plant expression.

Docket No: 137.14

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)



## Benefits

- Provides focused pest suppression, psyllids, Asian citrus psyllid by reducing populations
- Could result in a reduction in the use of insecticides in citrus production
- Can be applied as topical product or incorporated into citrus trees in expression systems

## Applications

- Safe and efficacious psyllid population suppression to aid reduction of transmission and spread of *Liberibacter asiaticus*, pathogenic bacteria in citrus.



# Two-line Breeding System in Sorghum

A novel, two-line breeding system based on a stable nuclear male sterile mutant *ms8* and its gene. The breeding system is efficient because it doesn't require breeding for A/B pair or R lines.

Docket No: 68.17

Contact: [Jeff.Walenta@usda.gov](mailto:Jeff.Walenta@usda.gov)



## Benefits

- Sorghum hybrids can be created by pollinating the bridge plants with any elite line or natural collection
- Simplified breeding process and more hybrid vigor
- Avoid devastating diseases that attack sorghum hybrids made with A1 cytoplasm

## Applications

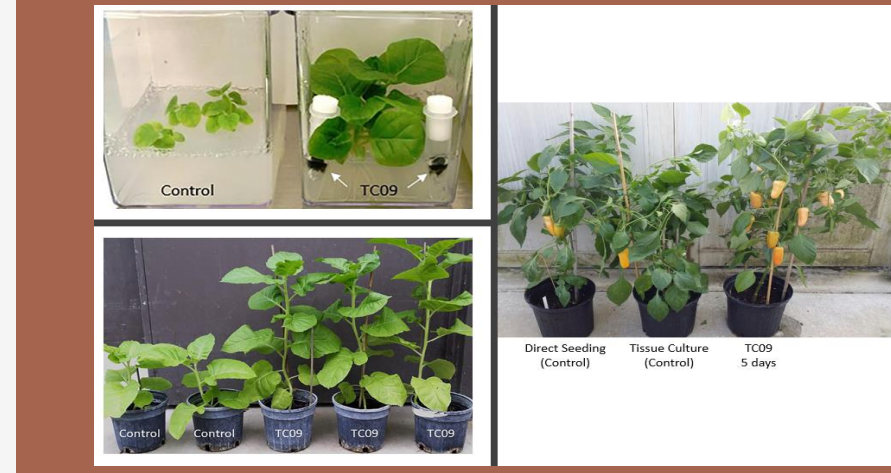
- Efficiently create hybrids for any type of sorghum, especially for biomass or special use sorghums, for which the traditional three breeding system has not been well-established.

# Fungal Volatiles to Promote Plant Growth and Increase Crop Productivity

This technology involves the use of non-phytopathogenic isolates of the fungal species *Cladosporium sphaerospermum* to rapidly promote plant growth, early flowering and increased crop productivity. All of these can be achieved by a short duration exposure of seedlings to the volatiles emitted by the fungus.

Docket No: 57.17

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)



## Benefits

- Speeds up the development of both shoots and roots within days of exposure
- Dramatically increases biomass
- Provides higher growth rates throughout the entire plant life cycle
- Achieves up to 20-day earlier flowering
- 100% increase in fruit yield
- Provides higher
- Improve root growth under both *in vitro* and *ex vitro* conditions
- Effective on many crop species in diverse plant families

## Applications

- May be incorporated in seedling preparation for field crops with transplant system, greenhouse crops and vertical agriculture operations
- The technology can be used to enhance root growth in tissue culture systems to overcome poor rooting-associated problems as well as to accelerate plant transformation systems

# Plant-mediated Silencing of a Fatty Acid – and Retinol-binding Protein in *Pratylenchus Penetrans*

Fatty acid- and retinol-binding (FAR) proteins are a family of proteins unique to *Pratylenchus Penetrans*, a species of nematodes. This invention consists of a region of the FAR-1 gene from the root lesion nematode that has been made into a dsDNA construct (ds-FAR-1) that is designed to silence the FAR-1 gene of root lesion nematodes. The reproduction of root lesion nematodes feeding on soybean roots engineered to contain this construct was significantly reduced.

Docket No: 199.16

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A root infected with  
many nematodes

## Benefits

- ds-FAR-1 can be used to engineer plants, or apply directly to plants, for resistance to root lesion nematodes
- Plants with resistance to root lesion nematodes decreases the use of fumigants and pesticides from nematode control
- Because the FAR-1 protein is found on in nematodes, application of this technology should not affect non-target organisms such as humans, plants, insects (e.g. bees), etc.

## Applications

- The ds-FAR-1 construct may be a useful technology for genetic improvement of plants that are susceptible to root lesion nematodes such as potatoes, soybeans, corn, fruits (apples, raspberries, and cherries), and lilies

# A Tool for Managing the Quality of Plant Products

This system provides a novel approach to quality management in plant-based products. Plants do not always do what we want. Sometimes stress is needed to get the human-desired outcome. This system consists of a combination of physiological information, plant temperature and water status, and an irrigation controller. The system allows a user to continuously monitor and manage the progress of the plant toward a desired quality outcome.

Docket No: 99.09

Contact: [Jeffrey.Walenta@usda.gov](mailto:Jeffrey.Walenta@usda.gov)



## Benefits

- Allows for the precise imposition and management of plant thermal and water stress
- Allows for management of quality-related plant outcomes in a highly reliable manner
- Useful in greenhouse and field settings
- Automated

## Applications

- Quality-related factors such as aromatics and taste parameters can be associated with plant status and modified over a season
- Provides water at minimum amounts to achieve desired outcome (product)



## ***Use of Phyllosphere Associated Lactic Acid Bacteria as Biocontrol Agents to Reduce Bacterial Growth on Fresh Produce***

The use of phyllosphere-associated lactic acid bacteria that demonstrate inhibitory effects on the growth and maintenance of human pathogens, such as *Salmonella enterica*, on the surface of food products, particularly fresh fruits and vegetables.

Docket No: 76.14

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)

### **Benefits**

- Bacteria are applied in liquid or freeze-dried powder forms onto food surfaces or agricultural environments that are already contaminated with pathogenic bacteria
- Treatment of produce can take place either pre- or post-harvest
- Easily implemented, low cost solution

### **Applications**

- Could be used to eliminate prevalent food-borne pathogens
- Bacteria could also be used to decontaminate food processing environments and machinery as part of a normal sanitization process

# Chromobacterium Species with Insecticidal Activity

A novel species of *Chromobacterium* that selectively kills lepidopteran insect larvae (such as, gypsy moth, diamondback moth, tobacco hornworm larvae, and cabbage looper larvae). Compositions containing *Chromobacterium spagni* sp. strains and the use of these compositions to kill insect larvae are covered by the U.S. and PCT patent applications. These compositions kill the indicated larvae at least as well as or better than some *C. subtsugae* biocontrol agents.

Docket Nos: 58.19

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Biocontrol agent
- Some species of lepidoptera have become resistant to currently used pesticides. Thus a need exists for new biocontrol agents

## Applications

- This invention covers an insecticidal bacterium that can be used to kill lepidopteran insect larvae without harming non-target insect larvae

# In-Row Rotary Cultivator

A hydraulically-driven rotary weeder for in-row cultivation of vineyards and other crops grown on a berm. This cultivator is especially useful for the removal of weeds in and around grapevines without major disruption of vine trunks and berms. It is also useful in wine grape production where certain herbicides such as glyphosate are prohibited. ARS researchers have developed a prototype that is about 90% complete.

Docket No: 17.09

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)



## Benefits

- Eliminates the use of herbicides while maintaining weed-free berm
- Provides weed control on berms where organic crops are grown
- May be used on a variety of bermed crops where weed-free zones are desired

## Applications

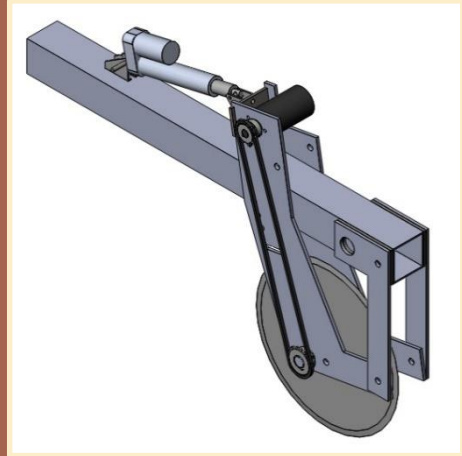
- May be used in and around a variety of crops grown on berms where a weed-free zone in between and around plants is desired. Rotary cultivator can be used with an existing tractor hydraulic system, or a remote oil tank can be used

# Modular Cutting Device for Cover Crop Residue

A modular cutting device for cover crop residue can improve planting quality in both row crop and vegetable no-till farming systems. Eliminates interference with planting unit by cleanly cutting through heavy surface residue utilizing higher RPM of the cutting disk compared to RPM obtained through free rotation (friction with soil) for traditional coulters. This versatile and compact modular design allows retrofitting of current commercially-available planting equipment for different planting configurations.

Docket No: 131.18

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)



## Benefits

- Provides effective and clean cutting of heavy cover crop residue for better quality planting cash crops directly into cover crop residue
- Modular design to allow different mounting configurations and available power sources such as mechanical, hydraulic and electric
- Vastly improved cutting effectiveness of cover crop residue over traditional cutting coulters especially in weight-limited small farm applications

## Applications

- For use in heavy cover cropping systems where tradition cutting coulters are less effective. This device can be adapted to any no-till planting system and equipment size



# Subsurface Applicator for Dry Manure

A novel, tractor-drawn implement that can apply dry poultry litter in shallow parallel bands beneath the soil surface. It can also be used for subsurface application of other dry bulky soil amendments such as manure, compost, or biochar. This technology utilizes an innovative auger system to crush and distribute dry, untreated poultry litter to soil openers, and no-till technology that minimizes damage to soil structure and perennial crops. It provides uniform litter distribution and precise control of litter application rates, including very low rates that are not feasible with litter spreaders.

Docket No: 64.07

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## Benefits

- Maximizes nutrient-use efficiency by preventing ammonia-N loss to the atmosphere, even during extended periods of adverse weather
- Improves water quality by preventing more than 90% of litter nutrient losses in storm runoff
- Increases crop yield and/or quality by retaining more nutrients and water in the soil
- Controls nuisance odor problems from litter

## Applications

- This technology can help farmers utilize organic nutrients more efficiently to increase production while improving air and water quality, especially in perennial pastures and other no-till systems

# Sorghum Derived Transcription Regulatory Elements Predominantly Active in Root Hair Cells

Transcription regulatory elements, namely promoter and terminator sequences, obtained from *Sorghum bicolor* that drive RNA transcription predominately in root hair cells, as well as cassettes, expression vectors, and genetically modified plants containing these transcription regulatory elements. The genetically modified plants can be gymnosperms, dicots, or monocots. Methods of directing transcription of a heterologous polynucleotide under control of these transcription regulatory elements in a genetically modified plant's root hair cells are also provided.

(Life Sciences)

Docket Nos: 77.18 + 183.07

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)



## Benefits

- The transcription regulatory elements selectively direct gene expression in root hair cells of a plant

## Applications

- Overexpress transporters in root hairs to increase a plant's ability to extract nutrients from the soil or alternatively as a means of removing soil contaminants
- Highly express secretory signal proteins in root hairs which would then be secreted into soil for collection
- Use of root hair promoters to express gene products capable of synthesizing pesticidal compounds, which when secreted in soil would reduce the need for synthetic pesticide treatments

# *Chromobacterium phragmitis* for Insect Control

*Chromobacterium phragmitis* is a newly discovered species of bacteria that has insecticidal activity against immature stages of both fly and moth pests. These bacteria are not insect pathogens, but produce compounds in culture that are toxic to the insects. This means that it is not necessary to maintain the viability of the bacteria in a product, and that the toxic compounds can be concentrated in post-fermentation processing.

Docket No: 109.15

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Cultures of *C. phragmitis* are more toxic to moth species than *C. subtsugae*
- An alternative to *Bacillus thuringiensis* with a broader activity spectrum

## Applications

- Cultured *C. phragmitis* can be used as an organic insecticide with activity against lepidopteran and dipteran insect pests such as cabbage looper, diamondback moth, and seedcorn maggot

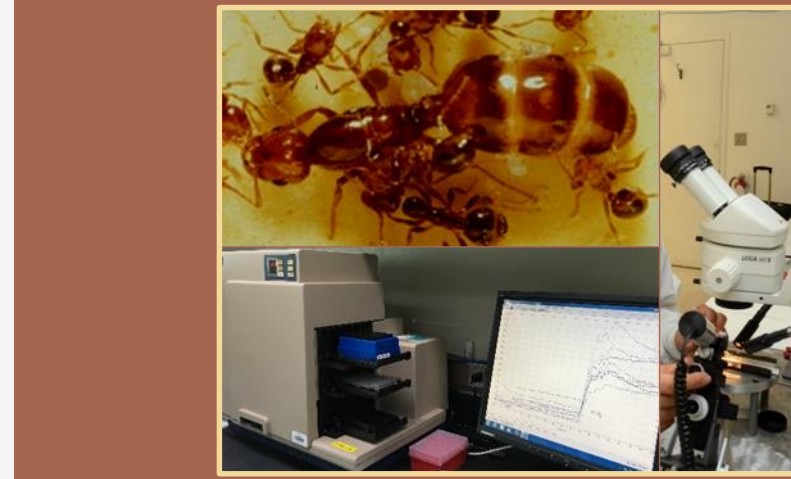
# Bioactive Peptides Having Insecticide Activity

Novel bioactive peptides were discovered using a receptor screening process. The peptides are structurally very different from the natural ligand(s) for this receptor. Injection of the novel peptides into fire ants (our model system) resulted in mortality. Interestingly, several peptides displayed similar mortality effects when fed to ants in a sucrose solution, thus, a bait-station system could be used as a novel control method to add to the fire ant integrated management tool box. Fire ants are an annual 6 billion dollar problem in the U.S. The screening method can be applied to a wide variety of receptors and insect pests, providing versatility and likely target specificity.

*(Life Sciences, Medical-Health)*

Docket Nos: 135.17 + 244.12

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)



## Benefits

- The novel peptide ligands show mortality effects when fed to fire ants – a bait formulations and fire ant control
- Peptide selection method is readily adapted to other target receptors and insect pests
- The control method is targeted rather than general.
- The peptides are expected to be an environmentally-friendly pest management tool

## Applications

- Bioactive peptides discovered can be used directly and/or formulated to control the fire ant and other insect pests.
- The technology for fire ant model, but the invention can be applied to any insect pest species.



# Novel *Nylanderia fulva* Virus

At least one novel virus capable of infecting crazy ants (*Nylanderia fulva*), along with polynucleotide sequences and amino acid sequences of the virus. The virus is capable of be used as a biopesticide to control populations of crazy ants.

*(Life Sciences, Medical-Health)*

Docket Nos: 47.16 + 36.14

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)

## Benefits

- This *Nylanderia fulva* virus is the first virus to be discovered from the invasive ant species *N. fulva*

## Applications

- Potentially the virus could be utilized as a biopesticide or biological control agent to eliminate or at least reduce the spread of *Nylanderia fulva* and their colonies
- The virus could serve as a gene delivery system to study functional genomics in the ant

# Small Hive Beetle Aggregation Pheromone

ARS has discovered and subsequently isolated and synthesized the small hive beetle aggregation pheromone. This pheromone serves as an effective attractant for adult beetles of both sexes. The pheromone may be placed within a trapping device for capturing adult small hive beetles.

*Docket No: 11.16*

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)



## Benefits

- Efficient pheromone-based trapping systems are the key to population reduction
- This system is cost effective and provides the necessary control measures for management or eradication of the small hive beetle

## Applications

- The trapping system can be employed within an apiary for monitoring and control of the small hive beetle.
- This technology will help give control of this invasive species that is effecting honey bee survival throughout the United States

# Double Stranded RNA Constructs for Aphid Control

Detailed are novel double stranded RNA constructs that target either Chloride Intracellular Channel (CLIC) or Sucrase gene expression in Aphids. The use of these constructs have shown increased mortality in aphid species, including but not limited to *Diuraphisnoxia*, *Myzuspersicae*, and *Schizaphisgraminum*. Also detailed are novel methods for pest management.

(Environmental, Life Sciences)

Docket Nos: 41.17 + 177.12

Contact: [Jeffrey.Walenta@usda.gov](mailto:Jeffrey.Walenta@usda.gov)



## Benefits

- Reduce the use of noxious chemical pesticides
- Broad application, effective against a range of aphid species
- Not harmful to beneficial insect species.
- Increased crop yields

## Applications

- The dsRNA construct can be used in conjunction with traditional baits in traps, applied topically to crops via a solution, or delivered to the target aphid population via a plant mediated delivery in a transgenic plant resistant to range of aphid species

# Novel Cytochrome P450 Enzymes from Sorghum Bicolor

Two novel cytochrome P450 genes isolated from sorghum, each gene encoding a protein having pentadecatrienyl resorcinol hydroxylase activity. Expression vectors containing these sequences are made and used to elevate levels of pentadecatrienyl resorcinol hydroxylase in transgenic cells and organisms. Divisional patent application. Parent U.S. patent No. is 9,284,537.

*(Life Sciences)*

Docket No: 41.16 + 145.12

Contact: [Cathleen.Cohn@usda.gov](mailto:Cathleen.Cohn@usda.gov)



## Benefits

- Modification and expression of the sorghum cytochrome P450 enzymes in plant cells could increase sorgoleone levels, or alternatively, introduce its biosynthesis into species lacking the endogenous sorgoleone biosynthetic enzymes

## Applications

- Potential use for engineering the production of sorgoleone and related phenolic lipids in crops for enhanced resistance to disease and for the ability to resist weed infestations



# Novel PPETAC1 Gene and Method to Manipulate Tree Architecture

A gene (PpeTAC1) identified from peach can be manipulated to influence branching angle and thus, overall tree architecture. Silencing or overexpressing the gene controls the branch angles (either upright or spreading).

*(Life Sciences)*

Docket No: 180.11

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Increased planting density
- Improved plant water use efficiency
- Reduced chemical sprays

## Applications

- Development of plant or tree varieties with erect growth habit for agriculture or ornamental uses

# The Effect of PPEGID1A on Vegetative Growth of Fruit Trees

A novel gene for a recessive dwarf trait in peach and its role in controlling tree size. Silencing the gene results in *Prunus* trees having a dwarf appearance while still retaining normal flower and fruit development. The degree of silencing corresponds to the degree of overall tree size.

(Life Sciences)

Docket No: 169.13

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Developing crop trees with different degrees of dwarfing could lead to high density production, reduce manual labor costs, and reduce the volume of chemical inputs needed
- Environmental benefit given that less agricultural land and chemical inputs are needed

## Applications

- *Prunus* tree industry
- Ornamental tree industry

# Potato Fertility Restoration

Transgenic Bintje potato plants have been developed that restore fertility and seed ball formation in sterile potato plants. The gene used in transgenic development is a family 1 cellulose-binding-domain encoding gene from *Phytophthora infestans*. Bintje control plants are male and female sterile while the transgenic plants are male sterile and female fertile thus enabling crosses to be made into transgenic Bintje to obtain Bintje potatoes with favorable traits. The *P. infestan* RB gene for resistance to late blight, and genes responsible for color and tuber shape have been transferred into Bintje germplasm. Selection for the absence of the CBD1 transgene provides null-segregants that are considered non-transgenic, *i.e.*, a non-transgenic potato having the desirable trait of resistance to late blight for example.

(Life Sciences)

Docket No: 162.13

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Use of the CBD1 gene in transgenic Bintje will allow for the introduction of new traits into previously infertile cultivar

## Applications

- The cultivar Bintje is one of the most widely used potatoes in Europe. Bintje has the advantage of having outstanding flavor, but some disadvantages are that it lacks disease resistance and the tubers are short and unsuitable for use commercially in the U.S., for example, where longer French fries are sold by fast food franchises. Thus, the possibility now exists for non-transgenic potatoes resulting from crosses with the transgenic Bintje potato to have the desirable traits of disease resistance and longer length while still maintaining the outstanding flavor of Bintje

# A Transgene Construct to Improve Fusarium Head Blight Resistance in Wheat and Barley

A gene encoding a wheat ethylene-responsive transcription factor was cloned into a plant gene expression vector. This vector when transformed into wheat and barley results in increased resistance to Fusarium head blight and other Fusarium-related diseases. The fungus responsible for this disease produces a mycotoxin that poses a significant threat to the human and animal health.

*(Life Sciences)*

Docket No: 168.11

Contact: [Renee.Wagner@usda.gov](mailto:Renee.Wagner@usda.gov)



## Benefits

- To date, no sources of wheat completely resistance to this disease have been found; therefore, fungicides are required for control. The problem is that the currently available registered fungicides only provide partial control (50-60%). Transgenic plants expressing this gene have significant resistance to this disease.

## Applications

- Fusarium head blight disease results in close to \$500 million in damage to the US wheat and barley crop. Transgenic plants expressing this gene results in significant resistance to this disease.



# Barley Mutant Lines Having Grain with Ultra-High Beta Glucan Content

A barley plant having grain with ultra-high beta-glucan content and total fiber.

*(Life Sciences, Medical-Health)*

Docket No: 53.12

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)

## Benefits

- A lower starch, but not empty endosperm line like other high beta-glucan lines
- Could provide high beta-glucan flour that is used in various food products
- Plants have normal looking morphology

## Applications

- Use as an critical parental line to significantly boost beta-glucan content in food barley cultivars
- Use as parental line to significantly boost total dietary fiber in food barley development
- Directly use it as dietary fiber extraction source

# Boron Complexes with Gradual 1- Methylcyclopropene Releasing Capability

Boron derivatives that are stable at ambient conditions and capable of releasing 1-methyl cyclopropene (1-MCP) gradually when in contact with water.

*(Life Sciences)*

Docket No: 47.14

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Quantitative and sensitive test
- Results obtained in 3 - 6 hours instead of days or weeks
- Controlled delivery of 1-MCP, selective application, cost effective multi-batch treatment option
- Potential to be used in open fields to increase crop yields

## Applications

- Treatment of perishable agricultural commodities such as fruits, flowers and vegetables, to retard ripening and thus prolong shelf-life by blocking the activities of ethylene

# Insecticidal Strain of *Serratia* for Control of Insects Such as Brown Marmorated Stink Bug (BMSB) *Halyomorpha Halys*

A strain of the *Serratia* bacteria that has insecticidal properties was identified. This strain can be used as a novel biocontrol agent and strategy for controlling brown marmorated stink bugs.

*(Environmental, Life Sciences)*

Docket No: 92.14

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)



## Benefits

- This bacteria strain was isolated in Maryland so they are native pathogens. In addition, the bacteria strain can be grown on standard laboratory media

## Applications

- This bacteria strain may be able to be used in a bait to control brown marmorated stink bugs

# Pseudomonas Fluorescens 2-79 with Genes for Biosynthesis of Pyrrolnitrin Improves Biocontrol Activity

Pseudomonas fluorescens 2-79 bacterial strains with pyrrolnitrin biosynthetic genes have enhanced biocontrol activity against the soil-borne pathogen *Rhizoctonia*.

(Environmental, Life Sciences)

Docket No: 128.11

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)

## Benefits

- There is no resistance in wheat or barley to *Rhizoctonia*, no fungicides are available, and all crops grow in rotation with wheat and barley are susceptible to *Rhizoctonia*

## Applications

- Could be used as a seed treatment to enhance biocontrol activity against *Rhizoctonia* root rot of wheat
- *Rhizoctonia solani* AG-8 is a disease of direct-seeded wheat and a barrier to wider adoption of conservation tillage, which is needed to control soil erosion



# Pseudomonas Fluorescens Inhibit Annual Bluegrass and Rough Bluegrass Root Growth and Germination

A biocontrol agent effective for controlling annual bluegrass and rough bluegrass root growth and seed germination comprising of one or more *Pseudomonas fluorescens* strains. Also provided are methods for use of these biocontrol agents to control the growth of annual bluegrass and rough bluegrass.

*(Environmental, Life Sciences)*

Docket No: 129.11

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## Benefits

- The biocontrol agent does not inhibit the growth of desired grasses, such as turfgrasses, cereal crops and native plants
- May be applied to the soil and/or seeds in the fall with inhibition occurring in subsequent years
- Can also be used in combination with herbicides and/or fertilizer

## Applications

- Inhibits the growth of annual bluegrass and/or rough bluegrass when they are most actively growing and out-competing desired plants (e.g., turfgrass, crops, and native plants)

# Compositions and Methods for Control of Hemipteran Insect Stylet Sheath Structure Formation

Many hemipteran insects form a stylet sheath each time they pierce and penetrate plant tissue on which they feed. Compounds that inhibit stylet sheath formation or degraded/destabilize stylet sheaths are described, as well as methods of using those compounds. These methods and compounds deter or block hemipteran insects from feeding on plants, especially agriculturally important plants and thus can prevent or reduce transmission of micro-organisms that use the insects as a carrier-host. PCT Application No.: PCT/US16/27824.

*(Environmental, Life Sciences)*

Docket No: 282.12

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## Benefits

- Compounds can be applied onto plants by spraying, dripping and/or applied to the soil for uptake by the roots
- Many of the compounds are recognized as generally regarded as safe (GRAS)

## Applications

- These compounds and methods prevent and/or reduce the transmission of vascular associated diseases (caused by hemipteran vector-borne pathogens) to plants

# Transplanter for a Walk-Behind Tractor

The transplanter is a self-propelled walk-behind tractor for no-till and/or organic vegetable small scale market farms and gardens. The transplanter is designed to help small farmers transplant vegetables and other seedling vegetables and to ensure good root system-to-soil contact.

*(Environmental, Electronics & Hardware)*

Docket No: 187.16

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## Benefits

- Adapted to small scale tractors
- The transplanter is operated by one person who simultaneously operates the transplanter and drives the walk-behind tractor
- Auxiliary racks of transplant vegetables can be attached to the tractor to enable the operator to reload the transplanter and thereby continuously transplant multiple plants
- The transplanter can be configured to plant more than one row simultaneously
- A no till system that mechanically transplants vegetables into cover crop residue

## Applications

- A walk-behind tractor to help small farmers transplant seedling vegetables

# Computer Vision Qualified Infrared Temperature Sensor

An integrated set of sensors, microprocessor, and devices with software that remotely measures surface temperature and simultaneously acquires an image for the purposes of qualifying the sensed temperature. The system can be used to aide in precision irrigation management of center pivot or lateral move irrigation systems by providing surface temperature data for use in irrigation scheduling algorithms and automatic irrigation. The system can also be used in greenhouse environments and in drip irrigated fields to help monitor plant abiotic (drought, chemical) and biotic stresses (disease, insect infestation).

*(Environmental, Electronics & Hardware)*

Docket No: 288.12

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## Benefits

- Can detect whether sensor sees plant or soil thus improving data quality immensely
- Greatly improved irrigation scheduling
- Much cheaper acquisition of data critical for real-time crop management
- Improved accuracy in crop yield forecasting
- Water conservation

## Applications

- Crop irrigation scheduling and automation
- Detection of crop nutrient deficiencies, pests, weeds, and diseases
- Crop yield forecasting